

# SYSTEM, METHOD, AND SUPPORT MECHANISM FOR SUPPORTING OBJECTS

## Field of the Inventions

- 5       The present invention relates to a system and support mechanism for supporting objects. In particular, the invention relates to a system and support mechanism for use in a vehicle that includes a movable and lockable utility station having a personal computer. The invention also relates to a method for supporting and locking an object, such as a utility station, in position.

## Background of the Inventions

- 10       It is known to construct a seat with a device that may be stowed in the armrest of the seat. Devices, such as tray tables, video/television screens, computer screens, and other interactive devices, have been stored in armrests of airplanes, buses, and terminal seats.
- 15       Devices of this type are useful because people in these environments must often wait or remain stationary for extended periods of time. Such devices offer entertainment and serve as a distraction during waiting times. Patents that discuss these devices include U.S. Patent No. 5,667,179 to Rosen (monitor support system on an aircraft); U.S. Patent No. 5,374,104 to Moore et al. (video device stored in armrest of aircraft seat); and U.S. Patent No.
- 20       5,177,616 to Riday (video device stored in armrest of aircraft seat).

- Due to continuing advances and developments in technology, the frequency of use of portable computers and other portable electronic devices has expanded from long-distance transportation vehicles, such as airplanes and buses, to other passenger vehicles, such as cars and trucks. Recent advances include tools for comfort, work, and navigation. These "tools"
- 25       include such things as personal computers, voice recorders, direction finders, control centers, televisions and video consoles, PALM Pilots, and travel desks suspended from dashboards or positioned between seats, among other amenities. Due to these advances, vehicles have taken on more of a role as a "mobile office," with drivers spending more time working from their vehicles. This pattern of use has come about due to the ability of
- 30       individuals to receive wireless telephone calls, facsimiles, and computer access in their vehicles while not in the office. As a result, vehicles are places where people spend a lot of time, whether by choice or force.

Because of the myriad of separate products that user's employ in vehicles, clutter may often proliferate and these tools often fill up space in an undesirable manner within the interior of vehicles. In addition, due to the increased offering of portable electronic devices, passengers in vehicles are now able to enjoy such items as personal computers, telephones, 5 televisions, and other amenities while traveling. Further, with the increased usage of computers due to the growth of the internet, passengers also like to take advantage of wireless internet usage during long trips. Thus, advances in technology have impacted the habits of both drivers and passengers of vehicles.

There are many advantages to providing operators and passengers of motor vehicles 10 with modern electronic conveniences. Techniques that were utilized in the past, however, often were not ideal, and served only to add to the clutter. For instance, computer lap tops have been used in vehicles, but must be placed in the lap of the person utilizing the device. Such use often results in eye and neck strain, due to poor ergonomics, among other problems. In addition, requiring a user to hold a portable computer in his or her lap can 15 serve as an impediment because it restrains users from moving freely and from utilizing their laps for holding other things, like papers or note pads. Furthermore, it is neither convenient nor safe for a driver of a vehicle to hold a computer on their lap while driving. As a result, many drivers place their computer and other tools of the trade in the passenger seat. This is both inconvenient and sometimes unsafe for the driver, who is attempting to pilot a vehicle, 20 and who needs to look at maps, telephone numbers, directions, or the like. It also poses a hazard to others on the road. In addition, electronic devices have often been damaged in situations where drivers must stop quickly, which results in the devices being thrown against the dashboard or onto the floor of the vehicle. Furthermore, when a passenger is present, this "work space" is not available.

Several patents teach the desirability of providing a work space in an automobile that 25 is separate from the passenger seat. For instance, U.S. Patent No. 5,769,369 to Meinel and U.S. Patent No. 5,673,628 to Boos both teach a support stand that is mounted to the vehicle floor board. A user may attach a personal computer to the top of the stand. U.S. Patent No. 5,279,488 to Fleming teaches a workstation for installation in a vehicle. U.S. Patent No. 30 6,032,910 describes a flexible arm stand for use in an automobile for holding a cellular phone or compact disc player. All of these devices have certain disadvantages. Some are

too large and cumbersome, some are not aesthetically pleasing, and some require that adjustments be made to the interior of the vehicle, among other things.

Other fields, such as the medical field, also benefit from support mechanisms for supporting objects, such as surgical tools. For instance, U.S. Patent No. 4,827,926 to Carol  
5 describes a flexible arm mechanism for use in brain surgery. The device includes a plurality of ball and socket connectors which form a flexible arm. The arm is readily movable to different orientations by moving the end of the arm. The arm is held in position due to friction between the balls and sockets of the connectors and their tight association between the connectors. The medical field can also derive a benefit from an improved support  
10 mechanism.

### Summary of the Inventions

The present invention relates to a personal computer system in a vehicle, a system for supporting a utility station relative to a base, a flexible support mechanism, a console for  
15 retractably supporting a utility station in an automobile, and a method for supporting an object with a flexible support mechanism that is attached to a base.

In one embodiment of the invention, the personal computer system includes a housing, a utility station and a flexible support mechanism. The housing is for storing the system in a vehicle in a stowed position. The utility station includes at least a personal  
20 computer. The flexible support mechanism is for supporting the utility station in an unstowed position and includes a first and a second end. The first end of the support mechanism is for association with the utility station and the second end is for association with a housing. The flexible support mechanism is orientable as desired in three dimensions within the vehicle to allow repositioning of the utility station between the stowed position  
25 and the unstowed position.

In one embodiment, the utility station may have at least one outer surface and may also include a utility tray that is disposed on the outer surface of the utility station. The utility station may be a lap top computer that is openable to expose a computer screen and a keypad.

30 The housing may be a console that has sufficient internal space for receiving and storing the support mechanism and the utility station therein. The console may include a lid that is openable and closable to allow insertion or withdrawal of the utility station and

support mechanism. The lid may include a plurality of peripheral indentations and is also closable when the support mechanism and utility station are extended outside the console, with the support mechanism positioned in one of the indentations. The lid may, alternatively, include a resilient peripheral edge so that the lid is closable when the support mechanism and utility station are extended outside the console such that the resilient edge deforms around the support mechanism to allow the lid to close.

The support mechanism may be configured and dimensioned to extend into both a front seat area and a rear seat area of a vehicle. The support mechanism may also include a locking mechanism which includes a locked state and an unlocked state. The support mechanism is lockable via the locking mechanism into a desired position. The support mechanism may be lockable by engaging a switch within a vehicle to engage the locking mechanism. The locking mechanism may be a pressure lock or a vacuum lock.

The personal computer system may also include a breakaway feature that is triggered when a vehicle is involved in an accident. When the support mechanism is in a locked state and the breakaway feature is activated, the support mechanism becomes substantially immediately flexible. In one embodiment, the breakaway feature includes a sensor positioned in a fender of a vehicle for sensing an accident.

The personal computer system may also include a lockout mechanism having at least one sensor for sensing at least one of an operational state of a vehicle, a position of a passenger within a vehicle, or a position of the utility station within a vehicle. The lockout mechanism includes a functional state wherein the utility station is useable, and a nonfunctional state wherein the utility station is unuseable. A positive reading of the sensor activates the nonfunctional state. The operational state of the vehicle includes at least moving, not moving, running, and not running; the position of the passenger includes at least driver seated, driver not seated, passenger in front seat seated, passenger in front seat not seated, passenger in rear seat seated, and passenger in rear seat not seated; and the position of the utility station includes at least positioned in driver's area, positioned in front passenger's area, positioned in rear passenger's area. A positive reading of the sensor occurs when at least one of the following is sensed: vehicle moving, vehicle running, driver seated, passenger in front seat seated, passenger in rear seat seated, utility station in driver's seat area.

The personal computer system also includes a power source for the personal computer. The power source is the battery of a vehicle and at least one power line extends from the personal computer to the battery of a vehicle.

- 5 The personal computer of the system may include a drive engine and at least one accessory. The drive engine may be positioned in the housing. The accessory may also be positioned in the housing. The housing may be positioned in a front seat area of a vehicle substantially down the middle of a vehicle.

- The personal computer system may also include a movable and retractable connection mechanism for connecting the support mechanism to the housing. The
- 10 connection mechanism may include a lockable anchor and an anchor recoiling rack. The lockable anchor is positioned within the anchor recoiling rack and the support mechanism is connected to the lockable anchor. The connection mechanism is configured and dimensioned to allow the lockable anchor to move within the anchor recoiling rack until a desired position is obtained, at which point the lockable anchor may be locked in position.
- 15 The lockable anchor is also unlockable when desired. A shock absorber may be provided between the second end of the flexible support mechanism and the housing. The shock absorber layer may include a layer of rubber.

- In another embodiment, flexible support mechanism includes a locking mechanism which includes a locked state and an unlocked state. The support mechanism is lockable via
- 20 the locking mechanism into a desired position. In this embodiment, the locking anchor may be lockable and unlockable by the locking mechanism.

- The invention also relates to a system for supporting a utility station relative to a base. The system includes a utility station, a base, a flexible support mechanism for connecting the utility station to the base, and a movable connection mechanism for movably
- 25 mounting the support mechanism relative to the base. The flexible support mechanism includes a plurality of links. The utility station is preferably orientable as desired in three-dimensions relative to the base.

- The system may include an anchor recoiling rack. In this embodiment, the movable connection mechanism is a locking anchor which is movable along the anchor recoiling rack
- 30 and the support mechanism is attached to the locking anchor. The anchor recoiling rack may include a channel and the locking anchor is positioned within the channel. The anchor recoiling rack provides a recoiling action which allows the support mechanism locking

anchor to return to a home position upon activation of a switch by a user. The support mechanism may include a locking mechanism which includes a locked state and an unlocked state, with the support mechanism being lockable via the locking mechanism into a desired position. The support mechanism locking mechanism may be engaged by a switch within the vehicle. The locking mechanism includes at least one of a pressure lock and a vacuum lock. In another embodiment, the support mechanism includes a locking mechanism which includes a locked state and an unlocked state. The support mechanism and locking anchor are lockable via the locking mechanism into a desired position.

The invention also relates to a flexible support mechanism for supporting an object.

- 10 The flexible support mechanism includes a plurality of links and a locking mechanism. The plurality of links are connected together to form a substantially flexible chain of links. The locking mechanism is selectively lockable to lock together the links and form a rigid structure. The locking mechanism includes a first mode in which the locking mechanism is unlocked and the chain of links is freely orientable as desired in three dimensions, and a
- 15 second mode in which the locking mechanism is locked and the chain of links is substantially immovable and rigid.

Each link includes at least first and second axes of movement. In addition, the support mechanism may also include a plurality of link connectors for connecting the links to create the chain of links. The links may be lockable about both the first and second axes of movement. The first axis of each link is spaced from and perpendicular to the second axis of each link.

- In one embodiment of the flexible support mechanism, the locking mechanism includes a vacuum forming device that locks the links together along their respective axes by a vacuum formed within the link connectors. The vacuum forming device includes at least
- 25 one vacuum tube and a vacuum cylinder positioned within the link connectors. In another embodiment, the locking mechanism includes a pressure forming device that locks the links together along their respective axes by pressure created within the link connectors. The pressure forming device includes at least one pressure tube and a pressure cylinder positioned within the link connectors. A resilient sleeve may be positioned around the
- 30 plurality of links.

The invention also relates to a medical support device that includes the flexible support mechanism for supporting an object and a medical device.

In another embodiment of the invention, the flexible support mechanism for holding an object includes a plurality of links and a plurality of connectors. The links each have a first end and a second end, with at least one leg extending from each end thereof. The plurality of connectors connect the legs of corresponding links to form a chain of links. The chain of links is flexible such that the position of the individual links in the chain of links is orientable as desired in three dimensions. The chain of links may include a first link and a last link, with the first link associated with a connection mechanism for connecting the first link to a base and the last link associated with an object being supported.

Each link of the plurality of links may have a first and a second end, with two legs extending from each end. The connectors connect two legs from one end of one link with two legs from one end of an adjacent link for movement about an axis defined by a longitudinal axis of each connector. The two legs on one end of a link each include an opening through which at least part of a connector extends. A friction pad may be associated with each leg or connector to provide frictional association between the legs and the connectors. A locking mechanism may be provided that is selectively lockable to lock together the links and form a rigid structure. The locking mechanism may include a first mode in which the locking mechanism is unlocked and the chain of links is freely movable, and a second mode in which the locking mechanism is locked and the chain of links is substantially immovable and rigid. The locking mechanism may include one of a pressure locking device and a vacuum locking device.

The invention also relates to a flexible support mechanism for use in a vehicle. The flexible support mechanism includes a plurality of links and a base. The plurality of links are connected together to form a substantially flexible chain of links that are orientable as desired in three-dimensions. The base is for connecting the chain of links to an interior of a vehicle. The links are configured and dimensioned to support an object positioned at one end of the chain. The vehicle may be an automobile having a front seat area and a rear seat area and the base is positioned substantially in a front seat area. The chain of links may be movable from a position in a front seat area to a position in a back seat area and returnable to a position in a front seat area. The object being supported may be a utility station that includes a personal computer.

The invention also relates to a console for retractably supporting a utility station in an automobile. The console body has a substantially hollow interior and an opening for

insertion and withdrawal of a utility station into the console body and a base positioned within the console body for attaching a support mechanism that supports a utility station. A cover may be associated with the opening defined in the console body. The cover is preferably openable for inserting and withdrawing a utility station and closable when a utility station is stowed inside the console body. The base may include a locking anchor for connecting a support mechanism to the base and an anchor recoiling rack, with the locking anchor being associated with the anchor recoiling rack for movement along the rack within the base. A shock absorber may be associated with the anchor recoiling rack.

The console body may be configured and dimensioned to entirely conceal a utility station and a support mechanism within the console. The console may also include a cover operatively coupled to the console for closing the opening in the console. The console is positionable in the front seat area or rear seat area of a vehicle. A shock absorber may be positioned between the console body and the base.

Another embodiment of the invention is a method for supporting an object with a flexible support mechanism that is attached to a base. The method includes providing an object at the end of a flexible support mechanism, moving the object to a desired location by moving the flexible support mechanism, and rigidizing the flexible support mechanism such that the support mechanism becomes rigid to firmly position the object at the desired location. The method may also include de-rigidizing the support mechanism to allow free movement of the support mechanism relative to the base, and stowing the support mechanism and object in a housing that is associated with the base. The housing may be provided around the base so that the support mechanism and object are concealed when stowed in the housing.

The method may also include providing a signal to the support mechanism that an accident has been encountered, and de-rigidizing the support mechanism upon receipt of the accident signal to allow free movement of the support mechanism relative to the base. The method may further include moving the support mechanism relative to the housing to obtain a desired position for the object and providing power to the object via the support mechanism.



## Brief Description of the Drawings

Preferred features of the present invention are disclosed in the accompanying drawings, wherein identical reference characters denote like elements throughout the several views, and wherein:

- 5        FIG. 1 shows a schematic of a console for housing the system of the invention;
- FIG. 2 shows a schematic of a utility station of the invention where the utility station is in the process of being withdrawn from the console of FIG. 1, with the cover of the console in the open position;
- FIG. 3 shows a schematic of the utility station of the invention in a withdrawn stage
- 10    in position next to a driver's seat of a vehicle;
- FIG. 4 shows a schematic of the utility station of FIG. 3 in position next to a passenger's seat of a vehicle;
- FIG. 5 shows a schematic of the utility station of FIG. 4 in position next to a passenger's seat of a vehicle with the utility station open such that a personal computer is
- 15    positioned for use and with the cover of the console in a closed position;
- FIG. 6 shows a schematic of the utility station of FIG. 2 in an extended position in the rear seat area of a vehicle with the utility station open such that a personal computer is positioned for use with the cover of the console in an open position;
- FIG. 7 shows a schematic of the utility station of FIG. 6 with the utility station closed
- 20    such that a utility tray is positioned in the rear seat area of the vehicle;
- FIG. 8 shows a schematic of an alternative embodiment of the console of FIG. 7 showing the console as including a slot for positioning the supporting mechanism of the invention therethrough to provide a different way to extend the utility station into the rear seat area of the vehicle;
- 25    FIG. 9 is a schematic depiction of a driver's seat of a vehicle in combination with an exposed side view of the inside of a console incorporating the system of the invention, with the system in a concealed position;
- FIG. 10 is a schematic depiction similar to FIG. 9, but with the system of the invention in a withdrawn position, showing two different positions for the support
- 30    mechanism and utility station of the invention;
- FIG. 11 is a schematic cut-away of the system of the invention without a console;
- FIG. 12 is a side view of a link of the support mechanism according to the invention;

FIG. 13 is a side view of a pair of links of the support mechanism showing an embodiment that incorporates a vacuum locking feature; and

FIG. 14 is a side view of a pair of links of the support mechanism showing an embodiment that incorporates a pressure locking feature.

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### Detailed Description of the Inventions

The present invention provides a system for supporting and storing an individual personal computer in an automobile. The invention also provides a flexible support mechanism that is orientable as desired in three dimensions, but which firmly supports an  
10 object in a fixed position. The invention advantageously allows manufacturer's of automobiles and consumers to choose the computer interface of their choice and to provide their own customized communication hardware and software within the vehicle of their choice. In a preferred automotive embodiment, the system is integral with the vehicle and not easily removed.

15 Referring to Figures 1-8, the system includes a combination utility station 10 and support mechanism 20 for use in a vehicle. Additional benefits are provided when the vehicle includes a front 40 and a rear seat 50 area, since the system may be used in both the front and rear areas of the vehicle. In a preferred embodiment, the utility station 10 includes a personal computer 12. A utility tray 14 may also be provided with the personal computer  
20 12 and integral therewith. The personal computer 12 may be any type of portable or other computer, such as a lap top computer or desktop organizer. When a lap top computer is utilized, the user may gain access to the keypad 16 and computer screen 18 of the lap top by opening the lap top in a conventional manner. Prior to opening the lap top 12, one or both of the outer surfaces of the computer may serve as a utility tray 14, for holding objects, such  
25 as drinks, writing pads, food, or other objects.

In one embodiment, the system may be totally concealed within a compartment of the vehicle, such as a console 24 or an arm rest 22, as shown in FIG. 1. In FIGS. 1-8, the console is positioned between the front seats of the vehicle. However, the console may be positioned at any number of positions within the vehicle, such as in or under the dashboard,  
30 behind the front seats, between the two seats in the rear of the vehicle, or in the armrests in the rear or front of the vehicle, among other locations. The utility station 10 in combination with the support mechanism 20 is configured and dimensioned such that both the utility

station 10 and support mechanism 20 may seat within the console 24. The console is preferably configured and dimensioned so that the user is not aware of the presence of the utility station 10 within the vehicle unless the station 10 is withdrawn from the console 24 for use.

When the utility station 10 is concealed within the console 24 such that the console lid or cover 26 is closed, the lid portion 26 of the console may serve as an arm rest 22 for the driver or passenger. In addition, the console 24 may also be closed when the utility station 10 is positioned outside the console 24, as discussed in greater detail below.

The utility station 10 is configured and dimensioned to fit inside the console 24 and for removal therefrom, as shown in FIG. 2. Advantageously, the support mechanism 20 is flexible and allows the utility station 10 to be positioned in the driver's area 42 of the vehicle (FIG. 3), in the passenger's area 44 of the vehicle (FIG. 4), or in the rear area 50 of the vehicle (FIGS. 6, 7, and 8).

As shown in FIGS. 5-8, the console lid 26 may include indentations 28 which are configured and dimensioned to allow the lid 26 to close around the support mechanism 20. These indentations may be spaced at any number of locations around the periphery of the lid 26. Alternatively, the lid may be provided with a resilient edge that allows the lid 26 to close around the support mechanism without requiring indentations. The console lid 26 closes around the support mechanism 20, but allows the support mechanism 20 to continue to be movable. When the console lid 26 is closed with the utility station 10 extended outside the console 24, the console lid 26 may also serve as an arm rest 22.

As shown in FIGS. 6 and 7, the utility station 10 may be used in the rear area 50 of the vehicle and the support mechanism 20 is extendable into the rear seat area 50. The utility station 10 may be used as a computer 12, as shown in FIG. 6, or as a utility tray 14, as shown in FIG. 7. If other features are available on the utility station 10, they may also be equally utilized in the front 40 and rear seat 50 areas.

Referring to FIG. 8, a slot-like or other opening 30 may be provided along at least a portion of the console 24 in order to allow the support mechanism 20 to extend more easily into the rear seat area 50. A similar opening (not shown) may be provided on other sides of the console, if so desired, in order to allow a greater range of motion of the support mechanism 20.

Referring now to FIGS. 9-11, a preferred support mechanism 20 is a flexible articulating arm, which is hinged to the utility station 10 at one end and to the console 24 at the other end. The support mechanism 20 may be hinged to the base 32 of the utility station 10 at one end and to a portion of the console at the other end. In one embodiment, the support mechanism 10 is connected to a base 36 within the console 24 (not shown). In another embodiment, the support mechanism 20 is hinged to a wall 38 of the console 24. The support mechanism 10 may be connected to the utility station 10 at any position on the utility station 10, such as the base 32 or sides 46 thereof, in any conventional manner, such as by screws, glue, magnets, rivets, or other connection mechanisms.

The support mechanism 20 includes a first mode of operation, in which it is flexible, freely movable, and unlocked. In the first, unlocked mode, the support mechanism 20 is configured such that it allows access to the utility station 10 in a wide variety of positions within the vehicle and is movable within three dimensions. In particular, the orientation and position of the utility station 10 is readily altered by simply exerting a directional force on the utility station 10 when the support mechanism 20 is in an unlocked mode. The support mechanism 20 preferably supports the utility station such that the user must only push, pull, rotate, lift, or otherwise move the utility station 10 into the proper position. For instance, the utility station 10 on the support mechanism 20 may be moved into the driver's position 42, the front passenger's position 44, or into the rear seat area 50 such that user's in the rear seat 50 of the vehicle may access the utility station 10. However, in the preferred unlocked state, user's cannot put significant force on the station 10 without moving it and the accompanying support mechanism 20. The range of movement of the support mechanism 20 is only limited within the vehicle to the areas which are not obstructed by stationary objects within the vehicle, such as the seats, the center console, the shift lever, the steering column, etc.

In a preferred embodiment, as shown in FIGS. 1-8, the utility station 10 is movable upwardly from the console 24, across the driver's seat 42, across the front passenger seat 44, and back behind the console 24 into the rear seat region 50 of the vehicle. In another embodiment of the invention, the system may also include a groove 48 positioned on the utility station 10 and a slide mechanism 52 for sliding within the groove 48. In this embodiment, the support mechanism 20 allows the user to move the utility station 10 between the front 40 and rear 50 of the vehicle, while the groove 48 and slide mechanism 52 allows a greater range of motion side-to-side. The slide mechanism 52 and groove 48 allow

side-to-side movement in both the front 40 and rear 50 areas. The groove 48 and associated slide mechanism 52 is an accessory feature of the invention, and not essential thereto. The slide mechanism 52 may include a separate locking feature (not shown).

The support mechanism 20 may also include a second or locked mode, in which the support mechanism 20 is locked in position, is rigid, and is substantially immovable. Once a desired position is obtained in the unlocked mode, the support mechanism 20 can be locked into position for use as a work station. In the locked mode, the support mechanism 20 can bear weight and is substantially immovable. In order to lock the support mechanism 20 into the desired position, the user positions the utility station 10 and support mechanism 20 in the desired position and activates the locking mechanism. Once the user activates the locking mechanism, the unit 10 is then held in position and is not movable without excessive force. The user may activate the locking mechanism by any number of commands, such as by pushing a button or switch, uttering a voice command, or any other activation technique known by those of skill in the art. The user may unlock the support mechanism 20 in a similar manner. An example of a push button 120 is shown in FIG. 1. In an alternative embodiment, the support mechanism does not support the weight of the utility station until the support mechanism is locked.

The support mechanism, also referred to as an "arm," is described in greater detail in connection with FIGS. 9-14. The arm is preferably constructed of multiple links 60 forming a chain 62 which may be articulated in three dimensions. The term "three dimensions" is defined in a broad mathematical sense to mean in the x, y, and z directions, and any where in-between those three directions.

The support mechanism 20 is constructed of links 60. The links 60 are made of composite, metal, plastic, or other materials. The chain 62 of links 60 is covered with a protective flexible sleeve 64. Cables 66 for power, communication, and lock control are provided inside the links 60, although this is not required of the invention. The support mechanism may also include a fitting for lubrication of the arm (not shown). As shown in FIGS. 9-11, the chain 62 of links 60 is preferably secured at a point on the interior of the console 24 and may be deformed to be entirely concealed during non-use, when the support mechanism 20 is stored in the console 24. FIG. 9 shows the support mechanism 20 and utility station 10 in a stowed position within a center console 24. FIG. 10 shows the support

mechanism 20 and utility station 10 in two different positions, a front position I and a rear position II.

A terminating device is positioned at each end of the support mechanism 20. This device serves as a fixation point for connecting the support mechanism 20 within the console 24, or for connecting the utility station 10 to the support mechanism 20. The fixation point for the support mechanism 20 may be a fixed point, or a movable fixation point. An example of a movable fixation point is a lockable anchor 70 on a retractable slide 72. This combination allows the device to retract or recoil within the console 24 when not in use.

The base end 68 of the arm 20 may be attached at any point within the interior of the console 24, such as on the base 36, as shown in FIGS. 9-11, or on the walls 38 thereof. The attachment between the base end of the support arm is preferably a locking anchor 70. The locking anchor 70 slides within an anchor recoiling rack 72, shown in FIG. 10. The anchor recoiling rack includes a channel in which the locking anchor 70 may travel. The locking anchor 70 in combination with a support system, such as the anchor recoiling rack 72, allows the user to position the base end 68 of the support arm at any number of positions along the track, which provides for more versatility in positioning of the utility station 10.

The locking anchor 70 and anchor recoiling rack 72 are loaded such that when the locking anchor 70 is unlocked, the anchor will recoil to a home position (not shown). This home position may be at an end of the rack 72, or somewhere along the length of the rack. The locking anchor 70 may be lockable with the locking mechanism 80, or may be separately lockable relative to the support mechanism. The locking anchor 70 locking mechanism may be engaged or disengaged by flipping a switch (not shown), among other activation techniques known to those of skill in the art.

A shock absorber 53 may be associated with the support mechanism in order to absorb shocks that may occur to the system due to roadway, or other, conditions. It is preferred that a shock absorber be provided between the support mechanism 20 and the base that the support mechanism is connected to. As shown in Fig. 11, the shock absorber 53 may be connected to the anchor recoiling rack 72. In addition, shock absorbers may be provided at other locations, such as between the utility station 10 and the support mechanism 20 (not shown).

The shock absorber 53 may be a layer of material, as shown in Fig. 11. This material is preferably resilient and may include rubber or polyurethane elastomers, among other resilient materials. An example of a material that may be used is sorbothane. Alternatively, other mechanical shock absorbers may be used, such as hydraulic shocks or air shocks, the invention not being limited to a particular type of shock absorber.

The arm 20 may be motorized to ease withdrawal from and replacement into the console 24, if so desired. Alternatively, the arm 20 and utility station 10 may be manually removed from and replaced into the console 24. The support member 20 and utility station 10 should be sized so that they fit within console 24 during non-use. As discussed in greater detail below, the arm 20 may be collapsible in the event of an accident to avoid injury to the user.

As shown in FIGS. 12-14, each link 60 of the support mechanism 20 has two axes of rotation that are positioned perpendicular to one another, a vertical axis A and a horizontal axis B. Substantially similar links 60 are connected to produce the flexible chain 62 of the support mechanism 20. Each link 60 allows rotation in both the horizontal and vertical directions in order to provide three-dimensional rotational capability. In particular, every other axis of the chain 62 is rotated by 90 degrees relative to the adjacent axis, which allows the chain to be positioned in all three dimensions. Each link includes two link axes A, B, each of which incorporates an axis locking mechanism 80. Each axes A, B can be locked at any angle, thereby allowing the support mechanism to be flexible until all axes locks are enabled.

The locking mechanism 80 is actuated by either vacuum, pressure, electro-mechanical, or other forces. The force of the locking mechanism 80 clamps the legs of the individual links 70 together in order to lock the support mechanism 20 in location. In use, prior to activating the locking mechanism 80, the user positions the support mechanism 20 in the desired location, such that the utility station 10 is properly positioned for use. Then the user activates the locking mechanism 80, either by pressing a button 120 or switch (not shown), through voice activation, or other activation technique, and the utility station 10 and support mechanism 20 are then locked in place. The user may deactivate the locking mechanism 80 in the same manner, by pressing a switch or button 120, uttering a voice command, or other deactivation mechanism, in order to allow the user to move the support

mechanism 20 out of the locked position. When the links 60 are unlocked, the support mechanism 20 and utility station 10 are freely movable.

Two types of locking mechanisms 80 are shown in the Figures. A first locking mechanism, as shown in FIG. 13, incorporates a vacuum axis lock 82a. A second locking mechanism, shown in FIG. 14, incorporates a pressure axis lock 82b. Each link 60 in the chain of links 62 includes a disc friction pad 84. The friction pads 84 facilitate the holding strength of each link 60. Each link includes two legs 85, which include openings 96. The links are configured such that one of the pairs of legs 85 of each link fits inside one of the pairs of legs 85 of the next link 60, in order to create the chain of links 62. The openings 96 are aligned such that when one end of each link 60 is inserted into the other link's end, the openings 96 in the respective links 60 substantially align.

All axis locks 82 are actuated in parallel. The combination of the links 60, axes, A, B, and axis locks 82 enable the apparatus to be situated in any position in an unlocked (free) mode. When the axis locks 82 are enabled, the desired position will be held and the support mechanism in combination with the utility station 10 will be capable of supporting a load.

Referring to FIG. 13, the vacuum axis lock 82a incorporates a friction pad 84, a top piston 86, a bottom piston 88, a vacuum cylinder 90, vacuum tubes 92, and O-rings 94. Top piston 86 and bottom piston 88 are inserted in openings 96 defined in successive links 60 to hold the links 60 together in a chain of links 62. A vacuum tube 92 is associated with the interior end 98 of top piston 86 and interior end 100 of bottom piston 88. O-rings 94 are provided between the vacuum tube 92 and the interior ends 98, 100 of the pistons, which serves as a seal for the vacuum when activated. Two flexible vacuum tubes 92 are associated with each vacuum cylinder 90 on respective sides thereof and extend through each link 60 in order to create a continuous vacuum tube 92 along the chain of links 62.

When a vacuum is applied inside the cylinder 90 through the vacuum tubes 92, the top 86 and bottom 88 pistons are pulled towards the center of the space 102 between the link legs 85. This vacuum action clamps the adjacent link legs 85 together, thereby holding the axis angle of the respective links 60. Each axis lock 82 is connected to the next axis lock via a flexible tube. When the vacuum is applied through the tube 92, all axes lock, making the flexible link chain 62 rigid and substantially immovable. The chain 62 is capable of supporting weight and force in the locked configuration. When the vacuum is removed, the



chain 62 becomes flexible and movable again. The vacuum is applied by the user activating a switch in order to initiate the vacuum lock.

Referring to FIG. 14, the pressure axis lock 82b incorporates a friction pad 84, an axis pin 104, O-rings 106, a top piston 108, a bottom piston 110, a pressure cylinder 112, and pressure tubes 114. The top and bottom pistons 108, 110 are seated inside space 102 between the link legs 85. The pressure cylinder 112 is situated between the top piston 108 and the bottom piston 110 around axis pin 104 within space 102. Flexible pressure tubes 114 are associated at two points on each pressure cylinder 112 such that tubes 114 extend from link 60 to link 60 in order to form a continuous pressure source along the chain of links 62. When pressure is applied inside the pressure cylinder 112 via tubes 114, the top 108 and bottom 110 pistons are pushed outwardly toward the heads 116 of axis pin 104. This action clamps the adjacent link legs 85 together, thereby holding the angle of each axes. When pressure is applied such that the axes of adjacent links 60 lock, the chain of links 62 is rigid and substantially immovable. The chain of links 62 is capable of supporting weight and external force when in the locked position, such as force that is applied in normal usage of a computer or writing station, among other forces. When pressure is removed from the pressure tubes 114 and pressure cylinder, the chain of links 62 becomes flexible and movable. Pressure is applied by the user activating a switch, or other activation mechanisms, in order to initiate the pressure lock. Pressure may be applied using air or any other gas or fluid.

A lockable tilt and rotate device 74 may be positioned at the utility station end 76 of the support mechanism 20. This locking feature is provided in addition to the axis locking feature 80 of the support mechanism 20. The lockable tilt and rotate device 74 allows the utility station 10 to tilt about 180 degrees and to swivel about 360 degrees relative to the support mechanism 20. This additional feature allows a user to lock the support mechanism 20 in position, but continue to optimize the position of the utility station 10.

Cables for power, communications, and lock control preferably run inside the links of the chain of the support mechanism, as shown in FIG. 11, which provides both protection to the cables and additional support to the support mechanism. The links and cables are covered by a protective flexible sleeve. This sleeve provides protection to the links and cables, cosmetic options, and sterile properties. The sleeve also provides a degree of additional support to the support mechanism. In addition, the cables extend from the base

end 68 of the support mechanism to various points within the vehicle, such as the battery for power, a modem for communications, and an actuating device for the lock control. These control mechanisms may be placed inside the console, or may be located at various positions within the vehicle. The protective sleeve may be made of plastic, rubber, or other flexible materials.

The system includes a supply of power for operating the personal computer and for regulating power to the utility station 10. In one embodiment, the power source may be provided by the vehicle's battery. The battery is a known source for stable electrical power since the battery powers various computer devices on the vehicle. A power line 118 is connected to the battery at one end and to the interior of the console 52 at the other end. The same or a different power line is associated with the interior of the console 52 and extends to the utility station 10 via the support mechanism 20. It is preferred that the power cord 118 be included within the sheath 62 that surrounds the support mechanism 20, although this is not essential to the invention. The power line 118 may be separate from the support mechanism 20. Alternatively, the utility station 10 may be powered by an independent battery source, other than the vehicle battery.

The utility station 10 is adaptable for use in any variety of vehicles, each of which may have varying capacity for housing the station 10. The system may be divided into a universal portion and a drive portion. The universal portion may include the computer keyboard, interface or computer display screen, phone, fax, etc., and tray designed for driver and passenger use. The universal portion is accessible by the user. The drive portion or engine may be embedded or concealed within the console 24 and may include the engine for driving the computer, the modem, additional memory, or other features that are not required to be accessible by the user. The delineation between the features that are accessible by a user and those which are not may be determined by individual or manufacturer's preferences, and are not critical to the invention. By providing a universal portion and a drive portion that are separate from one another, it allows the universal portion to be made as small or as large as desirable, which provides a safety feature of having a lighter, more easily collapsible utility station.

The entire station 10 and support mechanism 20 may be self contained to include the modem within the station 10 that is articulated within the vehicle. Alternatively, the modem and other parts of the personal computer may be housed within the console 24 in order to

limit the size of the utility station 10. For instance, the modem portion may be housed within the console 24.

In a preferred embodiment, the personal computer has wireless access to the internet and other communications media, such as phone and fax service. The phone and internet connection to the personal computer work together seamlessly using techniques known by those of skill in the art. In addition, the personal computer provides e-mail and fax capabilities, as well as a range of games, entertainment, videos, and travel services, as discussed in greater detail below.

The personal computer may be programmed to "personalize" its features for both the vehicle manufacturer and the purchaser of the vehicle. For example, computer activation may result in a welcome message to the vehicle owner. This message may include information concerning statistics about the vehicle owner requirements and maintenance schedules. The statistics concerning vehicle owner requirements could include such things as reminder's concerning vehicle registration, emission and other vehicle inspections, insurance renewals, etc. Maintenance information may include reminders concerning tire pressure requirements, fuel filling requirements, oil changes, etc. In addition, the computer programming may provide such information in a user friendly panel, or otherwise, on such features as other maintenance information, including preferred fuel and oil type, basic functions, spare parts, accessories and jack usage; manufacturer's guide to repair facilities; user's manuals; or other services, including entertainment, directions, maps, etc.

The personal computer may also preferably include communication capabilities via telephone, email, fax, the internet, or otherwise. The personal computer can serve as a telephone to replace existing cellular and digital telephones and include a speaker phone function to allow hands-free communication. All services may be voice-activated. In addition, email may be voice transmitted via the computer, both incoming and outgoing. All communication capabilities are provided through wireless connections. Alternatively, the system may be configured to allow the user to hook up to conventional communication lines via phone jacks and wires which may extend outside the vehicle. In this embodiment, it is clear that the vehicle will necessarily be stationary when conventional communication lines via phone jacks and wires are utilized.

Other basic services may also be provided by the computer programming and internet access, including: direction finding, map reading, "Star" services, weather reports, repair facilities en route, stock reports, access to financial, legal, and insurance advisors, etc.

The utility station 10 and support mechanism 20 are designed to collapse in the event that the vehicle is in an accident. This "break-away" feature is provided for safety reasons so that the system is not rigid in the event the vehicle is in an accident. This "break-away" feature may be triggered by a mechanism similar to that which triggers release of the vehicle air bags via sensors in the vehicles front bumper. Alternatively, accelerometers may be mounted inside the vehicle or the system in order to sense an accident condition. In an accident, this high impact information can be used to disable the axis locks, which places the device in its flexible state. The "break-away" feature serves to unlock the support mechanism such 20 that it is freely movable, instead of rigid.

In addition to the "break-away" feature, the system may also include an auxiliary battery for use in the event that the vehicle is in a collision that disables the vehicle's battery.

The use of the utility system in an emergency situation is desirable so that the passengers or drivers of the vehicle can call for help or activate the internet, among other things. As discussed above, the utility station may be wired to the vehicle's battery for operation. It is desirable to provide back-up battery power in the event that the main power source for the utility station is disabled. For instance, another battery may be provided in the vehicle that can operate the utility station for a shortened, or, if preferred, an extended period of time. This additional battery may be activated in the event that the vehicle's battery is disabled or disconnected. Switching to the additional battery may be manual or automatic. It may be desirable to provide both an automatic and a manual switching mechanism or procedure so that the user can manually switch the power, if desired. Alternatively, a portable battery pack may be provided that can be hooked up to the utility station in the event that the main battery or back-up battery are disabled.

Anti-theft features are also provided. Since the drive portion is preferably embedded in the console, it is not removable without great efforts. The utility station itself is not usable without the drive portion, which may serve to dissuade potential thieves. In addition, the console may be provided with a lock and a cover. The console may serve to camouflage the unit in its entirety, such that potential thieves may not know of its presence. In addition, the cover may be lockable. Other anti-theft features, such as a password for operation of the

system may be utilized. For instance, it is known with radios within vehicles to require the user to input a password after the vehicle's power has been shut off (such as when the battery is disconnected). Similar safety features may be incorporated in the system such that each unit requires a specific password or other starting feature that is only known to the user(s) in order to be operable. Other safety features known in the art may also be incorporated and are within the scope of the present invention.

In one embodiment of the invention, a safety mechanism is optionally provided whereby the system senses the location of the PC such that when in the vicinity of the driver, the PC will not operate unless the vehicle is not moving. For example, the personal computer may only be utilized by the driver when the vehicle is at rest and the gear shift is in the "Park" position. The vehicle may not be shifted into gear unless the personal computer is either housed in the console or in use by a passenger, out of the vicinity of the driver. The location of the utility station 10 relative to the driver's seat can be monitored. Alternatively, or in addition thereto, a driver's seat sensor is utilized to determine the presence of a person in the driver's seat, in addition to sensing the proximity of the utility station to the driver. Alternatively, the unit may not be functional when the driver is in the driver's seat, such that the unit is only usable when the vehicle is not in motion. In a preferred embodiment of the invention, the utility station 10 is usable by passengers when the vehicle is underway, but not by the driver.

The personal computer may be manufactured by any number of manufacturers, the invention not being limited to a particular design of personal computer. For instance, the suppliers of the personal computer could include Dell, IBM, Gateway, Apple, and others based on size, price, and other requirements. For example, a slim, trim, functional computer might be IBM's "Think Pad" lap top line featuring the thinnest, lightest models. Other manufacturers also make, thin, light weight computers. The computer utilized would preferably have the capabilities of state of the art personal computers in use today and in the future.

The exterior appearance of the system will be adaptable to the manufacturer's interior color schemes for each vehicle. The system may be unobtrusive and user friendly, with soft edges and padding. The system will also preferably be easy to utilize, such that little, if any, computer experience is necessary for a user to operate the system.

A similar, but adapted system may alternatively be utilized in airplanes, trains, buses, trucks, boats, or other vehicles. Activation may also be afforded by credit card.

Alternatively, the support mechanism 20 of the invention may be utilized in other fields where it is necessary to support objects, such as the medical or dental fields, among others.

- 5 For instance, it is often desirable in the medical, dental, and other fields, to have a device that is movable and flexible to be positioned precisely, but that is also lockable into a position that is substantially immovable. For instance, in surgery applications, medical instruments must often be placed into position and then fixed for the duration of the surgery. The lockable device of the invention would prevent movement during use of the lock in
- 10 order to avoid such things as accidental bumping of the device and subsequent movement. In addition, the system is scalable such that bigger and smaller versions of the device are possible depending upon the application. A larger, stronger device may be necessary in some situations while a smaller device may be possible in other situations. For example, the invention may be useful as a support mechanism for handicapped persons. It may be used to
- 15 support objects, but may also be used to support the weight of a handicapped person. Thus, the load capabilities of the device may be altered by the size, and type of locking mechanism selected. While the system of the application has been described in greater detail in connection with the automotive and vehicular industries, the system is also applicable to many other fields and should not be limited to the vehicular industry.

- 20 While the invention has been described in connection with a console as the storage unit for the system, it should be noted that other types of storage facilities are also anticipated to be within the scope of the invention, such as a cabinet or slot. Alternatively, a storage area may be provided, which does not include a housing of any sort. All that is required is that the support mechanism 20 be provided with a point for fixation, whether that
- 25 point be fixed or movable.

- While various descriptions, embodiments, and aspects of the present inventions are described above, it should be understood that the various features can be used singly or in any combination thereof. Each of the separate embodiments of the figures may be used in conjunction with or side-by-side with the other embodiments. Therefore, this invention is
- 30 not to be limited to only the specifically preferred embodiments depicted herein.

Further, it should be understood that variations and modifications within the spirit and scope of the invention may occur to those skilled in the art to which the invention

pertains. Accordingly, all expedient modifications readily attainable by one versed in the art from the disclosure set forth herein that are within the scope and spirit of the present invention are to be included as further embodiments of the present invention.